



Volunteer Lake Assessment Program Individual Lake Reports

OTTER POND, SUNAPEE, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	11,098	Max. Depth (m):	9.6	Flushing Rate (yr ⁻¹)	8.1
Surface Area (Ac.):	185	Mean Depth (m):	3.8	P Retention Coef:	0.43
Shore Length (m):	4,800	Volume (m ³):	2,820,500	Elevation (ft):	1125

TROPHIC CLASSIFICATION

Year	Trophic class
2005	MESOTROPHIC
2008	MESOTROPHIC

KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator and the chlorophyll a indicator is okay.
	pH	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	Oxygen, Dissolved	Encouraging	There are < 10 samples with 0 exceedances of criteria. More data needed.
	Dissolved oxygen satura	Encouraging	There are < 10 samples with 0 exceedances of criteria. More data needed.
	Chlorophyll-a	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator.
Primary Contact Recreation	Escherichia coli	Very Good	Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria.
	Chlorophyll-a	Very Good	There are a total of at least 10 samples with 0 exceedances of indicator.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

OTTER POND - MORGAN BEACH	Escherichia coli	Very Good	Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria.
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WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	9.34	Barren Land	0.52	Grassland/Herbaceous	0.45
Developed-Open Space	3.87	Deciduous Forest	11.3	Pasture Hay	1.84
Developed-Low Intensity	3.36	Evergreen Forest	25.39	Cultivated Crops	0.18
Developed-Medium Intensity	0.2	Mixed Forest	35.78	Woody Wetlands	4.18
Developed-High Intensity	0.01	Shrub-Scrub	2.01	Emergent Wetlands	0.31



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OTTER POND, SUNAPEE

2014 DATA SUMMARY

OBSERVATIONS AND RECOMMENDATIONS (Refer to Table 1 and Historical Deep Spot Data Graphics)

- ◆ **CHLOROPHYLL-A:** Chlorophyll levels were slightly above average in May, decreased to average levels in June, spiked to elevated levels in July, and then decreased to average levels in August and remained stable into September. The 2014 average chlorophyll level was the highest measured since monitoring began and historical trend analysis indicates significantly increasing (worsening) chlorophyll levels since monitoring began.
- ◆ **CONDUCTIVITY/CHLORIDE:** Deep spot conductivity levels remained slightly elevated and greater than the state median. Historical trend analysis indicates significantly increasing (worsening) epilimnetic (upper water layer) conductivity since monitoring began. Tributary conductivity levels remained elevated, particularly at the Star Lake 2 station which receives runoff from I-89. Although chloride monitoring was not conducted in 2014, the 2013 chloride levels at Star Lake 2 exceeded the chronic chloride standard of 230 mg/L indicating the potential to disrupt the survival and reproduction of aquatic life.
- ◆ **E. COLI:** Beach E. coli levels were very low and much less than the state standard of 88 cts/100 mL on each sampling event.
- ◆ **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels were slightly above average in May and June potentially due to spring snowmelt, rainfall and higher water levels. This may have prompted the elevated algal growth in July. Epilimnetic phosphorus levels decreased to low levels from July through September and the 2014 average epilimnetic phosphorus was less than the state median. Historical trend analysis indicates stable epilimnetic phosphorus since monitoring began. Hypolimnetic (lower water layer) phosphorus was stable and low on each sampling event. All tributaries experienced slightly higher phosphorus levels on the June sampling event. Baptist Bk. phosphorus was slightly elevated in July following a rain event and the turbidity was also elevated. Star Lake 2 phosphorus levels were also slightly elevated in July. All other tributary data were within average ranges for those stations.
- ◆ **TRANSPARENCY:** Transparency was worse in May and July during the periods of higher algal growth and better in June, August and September when algal growth was lower. Average transparency was slightly lower (worse) than the state median, and in particular has remained at a lower level since 2006. Historical trend analysis indicates significantly decreasing (worsening) transparency since monitoring began.
- ◆ **TURBIDITY:** Epilimnetic and hypolimnetic turbidities were slightly elevated in May during the period of spring snowmelt, high water levels, and lake turnover. Turbidities decreased to average levels for the remainder of the season, however historical trend analysis indicates significantly increasing (worsening) epilimnetic and hypolimnetic turbidity since 1995. Baptist Bk. turbidity was slightly elevated in May during spring snowmelt and elevated in July following a rain event and organic matter was noted in the sample. Outlet turbidity was also slightly elevated in May. Star Lake 2 turbidity was elevated in May, June and September, and laboratory notes indicate highly colored water with high organic content.
- ◆ **PH:** Epilimnetic pH levels were within the desirable range 6.5-8.0 units, however have been less than desirable in the past. Historical trend analysis indicates significantly decreasing (worsening) epilimnetic pH since monitoring began. Hypolimnetic pH levels were slightly less than desirable in May, August and September.
- ◆ **RECOMMENDED ACTIONS:** The worsening water quality trends are a concern. The increased algal growth has likely contributed to the decreased transparency and increased turbidity at the deep spot. Also, since 2006, NH has experienced an increase in the frequency and intensity of storm events which may have also contributed to worsening transparency and turbidity. It is important to manage stormwater runoff in the watershed, particularly from paved, dirt and gravel roads, parking lots and driveways, and steep slopes. Work with local road agents to identify areas of stormwater runoff and install stormwater best practices to reduce runoff into the pond; as well as encourage local road agents to utilize winter deicing best practices to reduce the impact of road salt on the pond. Water levels were high throughout the summer and it is important to maintain water flow through the Outlet to maintain a normal water level and help flush nutrients and sediments out of the pond during significant storm events. Contact the VLAP Coordinator to schedule a biologist visit for May/June in 2015. Keep up the great work!

Station Name	Table 1. 2014 Average Water Quality Data for OTTER POND								
	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans.		Turb. ntu	pH
						m			
						NVS	VS		
Epilimnion	6.62	5.05	127.3		10	3.09	3.26	1.17	6.63
Hypolimnion			126.6		10			1.58	6.49
Baptist Brook			186.8		11			2.00	6.51
Beach				3					
Little Sunapee Brook			101.8		7			0.74	6.54
Outlet			127.3		8			1.10	6.56
Star Lake 2			660.4		17			13.81	6.22
Star Lk Inlet			93.0		13			1.44	6.05

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

Chloride: > 230 mg/L (chronic)

E. coli: > 88 cts/100 mL – public beach

E. coli: > 406 cts/100 mL – surface waters

Turbidity: > 10 NTU above natural level

pH: between 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.

Alkalinity: 4.9 mg/L

Chlorophyll-a: 4.58 mg/m³

Conductivity: 40.0 uS/cm

Chloride: 4 mg/L

Total Phosphorus: 12 ug/L

Transparency: 3.2 m

pH: 6.6

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Worsening	Data significantly increasing.	Chlorophyll-a	Worsening	Data significantly increasing.
pH (epilimnion)	Worsening	Data significantly decreasing.	Transparency	Worsening	Data significantly decreasing.
			Phosphorus (epilimnion)	Stable	Trend not significant; data show low variability.

